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(4)

JP 3297830

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CLAIMS

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(57) [Claim(s)]

[Claim 1] The remote control of the HEL characterized by to constitute so that the operation termination sensor which detects what a pilot's hand separated the hovering actuation which a HEL flaps for from the operating member of said transmitter in the remote control of the HEL performed by automatic control by one place of the air while carrying out remote control of the HEL based on the control signal of a transmitter may be formed in a transmitter and operation termination detection of this sensor may be made to perform hovering actuation automatic control automatically.

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the remote control of the HEL used for the chemical spray of a field, or aerial photograph photography.

[0002]

[Description of the Prior Art] As conventionally shown in JP,5-285276,A, there was a technique which controls the altitude of a HEL to abbreviation regularity. Moreover, as shown in JP,4-46898,A, there was a technique of forming an airraid distance sensor in a HEL.

[0003]

[Problem(s) to be Solved by the Invention] Although the pilot had the transmitter which carries out remote control of the HEL in the hand and was operating it, when a pilot's hand separated from the operating member of a transmitter by accidents, such as a pilot's fall, the HEL flew in the state of un-controlling, and said conventional technique fell, and had the problem of damaging a HEL.

[0004]

[Means for Solving the Problem] being appropriate — it being alike, and this invention, while carrying out remote control of the HEL based on the control signal of a transmitter In the remote control of the HEL which performs hovering actuation which a HEL flaps by one place of the air by automatic control It is what was constituted so that the operation termination sensor which detects what a pilot's hand separated from the operating member of said transmitter might be formed in a transmitter and operation termination detection of this sensor might be made to perform hovering actuation automatic control automatically. By a pilot's hand separating from the operating member of a transmitter by accidents, such as a pilot's fall, and stopping operation Since hovering actuation automatic control is automatically started based on the detection result of said operation termination sensor While being able to prevent easily a HEL being held compulsorily at a hovering condition, making the flight of a HEL continue by hovering actuation, and a HEL being in the condition of not controlling, by the accident by the side of a pilot, and falling Even if it interrupts operation temporarily at the time of a shift of a pilot or migration, a HEL may be made to stand by by hovering operating state, and improvement in handling operability etc. can be easily performed in the improvement list of safety.

[0005]

[Example] Hereafter, the example of this invention is explained in full detail based on a drawing. While drawing 1 is a transmission-control circuit diagram, drawing 2 is the explanatory view of a HEL and a transmitter, and (1) is a HEL for nolo flights among drawing and making an airframe (5) decorate with a main rotor (2), a tail rotor (3), and a leg object (4) each Rota — the engine (6) which drives (2) and (3), and each Rota — said airframe (5) is made to install inside the receiving controller (7) which controls an engine (6) rotational frequency etc. in the pitch angle list of (2) and (3) Moreover, while making a drugs tank (8) carry in the leg object (4) attachment section of said airframe (5) and sending out the agricultural chemicals of this tank (8) from spraying opening (10) through the delivery section (9) The altitude sensor (11) formed with the ultrasonic range finder which has the ultrasonic discharge section and a receive section is made to fix to the anterior part inferior surface of tongue of an airframe (5). Fire a supersonic wave towards the ground from said sensor (11), and the supersonic wave reflected from the ground is made to detect in said directive sensor (11) receive section, and it constitutes so that the distance (altitude) of a HEL (1) and the ground may be made to measure. In addition, said sensor (11) has large directivity, and it is constituted so that altitude detection can be performed without carrying out \*\*\*\*\* effect on the airraid inclination of a HEL (1).

[0006] Furthermore, in the square cube type case (13) which (12) is a transmitter among drawing and a pilot has with both hands, while attaching a liquid crystal display (16) etc. in the right-and-left stick (14) which is an operating member, and (15) lists It has the right-and-left touch sensor (17) which is the operation termination sensor formed by a piezoelectric device or a capacitor etc. which senses acupressure of the thumb put on a stick (14) and (15), and (18). As shown in drawing 3, a right-and-left touch sensor (17) and (18) are attached in right-and-left stick (14) and (15) upper limit. It is the thing which a pilot makes detect whether it is in the

operation condition which put the thumb on a stick (14) and (15) by the touch sensor (17) and (18). The touch sensor (17) which is the operation termination sensor which detects what a pilot's hand separated from the stick (14) which is the operating member of said transmitter (12), and (15), and (18) are prepared in a transmitter (12). When a pilot's thumb separates [ accidents, such as a pilot's fall, / the time of generating, and a pilot ] from a stick (14) and (15) at the time of a shift or migration and a HEL (1) changes into the condition of not controlling. It constitutes so that said touch sensor (17) and (18) may be made to detect the condition of a HEL (1) of not controlling.

[0007] Furthermore, en KOMBORYUMU to which the advanced actuation (perpendicular rise and fall) signal which performs set pitch accommodation of a main rotor (2) to an engine (6) output list based on the lengthwise direction control input of a right stick (15) is made to output as shown in drawing 1 (19), The aileron volume to which the longitudinal-direction flight signal which performs horizontal period pitch accommodation of a main rotor (2) based on the longitudinal direction control input of a right stick (15) is made to output (20), The elevator volume to which the cross-direction flight signal which performs vertical period pitch accommodation of a main rotor (2) based on the lengthwise direction control input of a left stick (14) is made to output (21), It has the ladder volume (22) to which the direction actuation signal of an airframe which performs pitch accommodation of a tail rotor (3) based on the longitudinal direction control input of a left stick (14) is made to output. While connecting said display (16) and each volume (19) – (22) to the transmitting controller (23) of the transmitter (12) formed with a microcomputer The aforementioned right-and-left touch sensor (17) and (18) are connected to a transmitting controller (23), and it constitutes so that said each volume (19) – (22) output may be transmitted to the receiving controller (7) of a HEL (1) at said each sensor (17) and (18) output lists. In addition, in drawing 1 , a power-source dc-battery and (25) are hovering en conte rims to which a main switch and (26) set [ electrical-potential-difference meter and (27) ] the pitch trim to which the antenna for transmission, (28), (29), (30), (31), and (32) set a mode change-over switch and (33) sets the reference value of pitch accommodation a main rotor (2) as for (24) and (34) sets the hovering actuation altitude of a HEL (1).

[0008] Furthermore, a HEL (1) is equipped with the gyroscope for ailerons (35), the gyroscope for elevators (36), and the gyroscope for ladders (37) which are formed with 3 shaft gyroscope and which are a sensor for flight stabilizers as shown in drawing 4 . Said altitude sensor (11) and said each gyroscope (35) While making a receiving controller (7) make input connection of – (37) The servo motor for en contests which set pitch accommodation of a main rotor (2) is performed [ servo motor ] to an engine (6) output list, and carries out the perpendicular rise and fall of the HEL (1) (38), The servo motor for ailerons which horizontal period pitch accommodation of a main rotor (2) is performed [ servo motor ], and flies a HEL (1) to a longitudinal direction (39), The servo motor for elevators which vertical period pitch accommodation of a main rotor (2) is performed [ servo motor ], and flies a HEL (1) to a cross direction (40), It is what carries out output connection of said receiving controller (7) to the servo motor for ladders (41) which pitch accommodation of a tail rotor (3) is performed [ servo motor ] and makes the direction of a HEL (1) change, and the servo motor for pitches (42). In the remote-control signal from said transmitting controller (23), and a list at each gyroscope (35) – (37) input and a list by the altitude sensor (11) input Each servo motor (38) While operating – (42) and carrying out remote control of the HEL (1) based on the control signal of a transmitter (12) It constitutes so that automatic control may perform hovering actuation which a HEL (1) flaps by one place of the air and operation termination detection of the aforementioned right-and-left touch sensor (17) and (18) may be made to perform hovering actuation automatic control automatically. In addition, as for a power-source dc-battery and (44), in drawing 4 R> 4, (43) is [ a main switch and (45) ] receiving dishes.

[0009] Constitute like the above, a pilot has a transmitter (12) with both hands, and this example puts the thumb of both hands on the right-and-left stick (14) (15) upper-limit section. It is what a right-and-left stick (14) and (15) are made to concentrate on a lengthwise direction and a longitudinal direction, and remote control of the HEL (1) is carried out [ what ], and flies it. While a touch sensor (17) and (18) detect the thumb put on a stick (14) and (15) and making it input as shown in the flow chart of drawing 5 R> 5 that it is in a remote-control condition Each servo motor (38) – (42) is operated by each gyroscope (35) – (37) input to each volume (19) – (22) input list of a transmitting controller (23). Remote control is made to perform flight control action, a HEL (1) is flown and the agricultural chemicals of a drugs tank (8) are made to emit to a field from spraying opening (10) by a pilot's remote operation.

[0010] Moreover, while flying the HEL (1) using said transmitter (12) The accident which a pilot reverses occurs or a pilot At the time of a shift or migration When the thumb separates at least from one side of the aforementioned right-and-left stick (14) and (15), or a pilot drops a transmitter (12) and a HEL (1) flies in the state of un-controlling. If the touch sensor (17) to a receiving controller (7) and (18) inputs are interrupted Automatic hovering control action is started and the flight of a HEL (1) is made to continue by hovering actuation which carries out the halt flight of the HEL (1) in an abbreviation fixed location in the air based on said each gyroscope (35) – (37) input. It has prevented a HEL (1) falling according to the condition by the side of a pilot of not controlling.

[0011] Moreover, while flying the HEL (1) using said transmitter (12) When each volume (19) – (22) input which changes the altitude of a HEL (1) cannot be found, It judges whether the HEL (1) is flying with crop-dusting activity altitude by the altitude sensor (11) input. When it becomes below high setting altitude from the altitude which can avoid contact to terrestrial crops lower than altitude required for crop dusting to terrestrial or terrestrial crops when the initialized activity altitude differs from the actual altitude of a HEL (1) for example, Make automatic hovering control action perform automatically, and the halt flight of the HEL (1) is carried out in an orientation in the air. Based on altitude detection of an altitude sensor (11), a HEL (1) is automatically raised even to predetermined initialization altitude by next. While preventing contact with the ground of the HEL (1) by a pilot's operation mistake, blow, or transceiver [ poor ] etc. When altitude becomes high more than the predetermined range rather than the activity altitude initialized above the setting altitude to which the aforementioned automatic hovering control action is performed, or when it becomes low, It is based on altitude detection of an altitude sensor (11), and a HEL (1) is automatically descended or raised even to predetermined initialization altitude. Keep the activity altitude of abbreviation regularity automatic and \*\* HELs (1) are flown. automatically proper [ in a HEL (1) ] to wind or HEL (1) weight change (the amount change of loading agricultural chemicals), or unripe operation actuation (altitude eye measurement misconception) of a pilot — it is made to fly by being advanced and crop-dusting precision, safety, etc. are raised.

[0012] In addition, like a pitch trim (33) or a hovering en conte rim (34), a pilot may adjust the above mentioned activity altitude and setting altitude on a stepless story before activity initiation, and may do a setting input beforehand in semipermanent.

[0013] Moreover, even if hovering actuation is performed by automatic control, priority is given to manual remote operation of said stick (14) and (15), and the above mentioned automatic hovering control action is performed, while operating automatically each servo motor for the object for en contests, the object for ailerons, and elevators (38), (39), and (40) and making them perform based on the object for ailerons, and each gyroscope for elevators (35) and (36) outlets. In addition, manual remote operation of a stick (14) and (15) is received in the actuation which controls automatically each servo motor for the object for en contests, and pitches (38), and (42) based on an altitude sensor (11) output, and is maintained at predetermined altitude. By forming the mode change-over switch for manual switching (28) over which you may make it carry out by giving priority during a crop-dusting activity, and priority is given to each servo motor (38) and (42) automatic control in a transmitter (12) Priority can be given to the automatic altitude control of a HEL (1) during a crop-dusting activity, it can be given to the altitude accommodation by manual remote operation of a HEL (1), and a HEL (1) can be made to make take-off and landing.

[0014]

[Effect of the Invention] While this invention carries out remote control of the HEL (1) based on the control signal of a transmitter (12) above so that clearly from an example In the remote control of the HEL which performs hovering actuation which a HEL (1) flaps by one place of the air by automatic control The operation termination sensor (17) and (18) which detect what a pilot's hand separated from the operating member (14) of said transmitter (12) and (15) are prepared in a transmitter (12). It is what was constituted so that operation termination detection of this sensor (17) and (18) might be made to perform hovering actuation automatic control automatically. By a pilot's hand separating from the operating member (14) of a transmitter (12), and (15) by accidents, such as a pilot's fall, and stopping operation Since hovering actuation automatic control is automatically started based on the detection result of said operation termination sensor (17) and (18) A HEL (1) is held compulsorily at a hovering condition, and the flight of a HEL (1) can be made to continue by hovering actuation. While being able to prevent easily a HEL (1) being in the condition of not controlling, by the accident by the side of a pilot, and falling Even if it interrupts operation temporarily at the time of a shift of a pilot or migration, a HEL (1) can be made to be able to stand by by hovering operating state, and improvement in handling operability etc. can be easily performed in the improvement list of safety.

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DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] Transmission-control circuit diagram.

[Drawing 2] A HEL and the explanatory view of a transmitter.

[Drawing 3] The enlarged drawing of a stick.

[Drawing 4] Reception-control circuit diagram.

[Drawing 5] The flow chart of front drawing.

[Description of Notations]

(1) HEL

(12) Transmitter

(14) (15) Stick (operating member)

(17) (18) Touch sensor (operation termination sensor)

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[Translation done.]

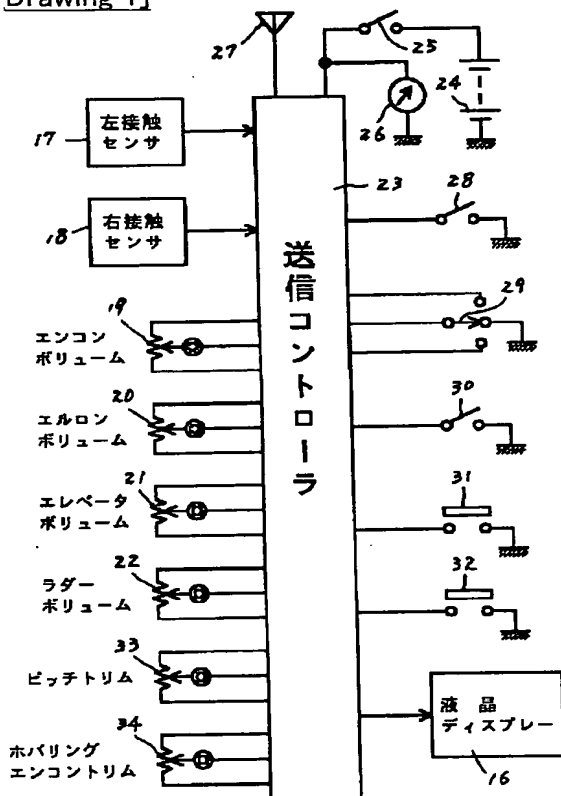
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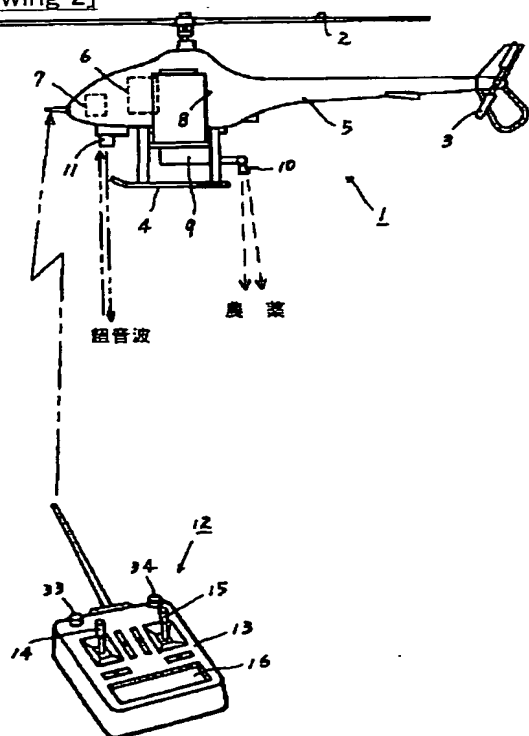
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## DRAWINGS

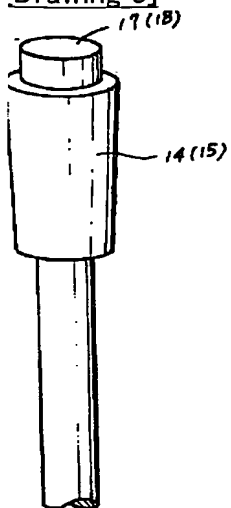
[Drawing 1]



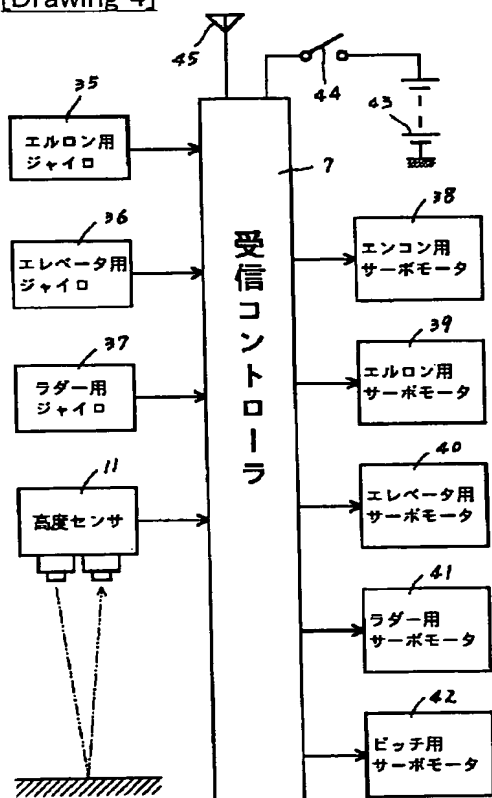
[Drawing 2]



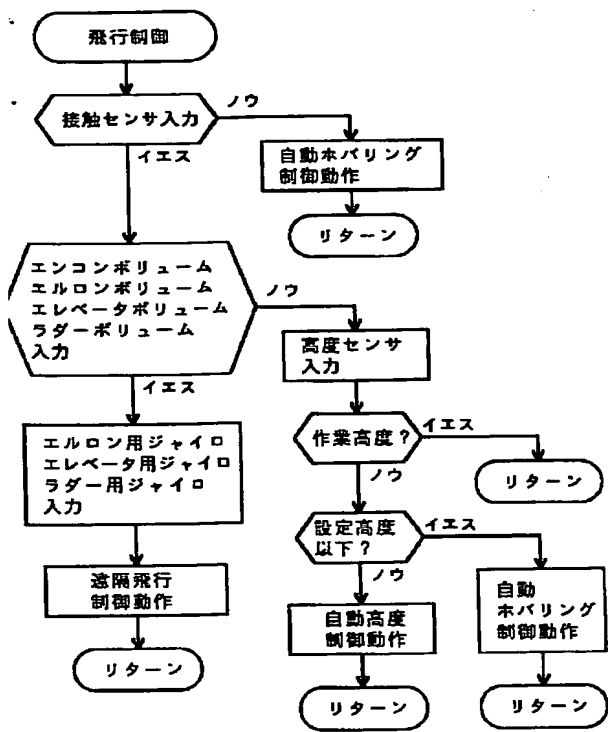
[Drawing 3]



[Drawing 4]



[Drawing 5]



[Translation done.]